National Spent Nuclear Fuel Program

Source Term Development Status

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Providing for safe, efficient disposition of DOE spent nuclear fuel

Presentation Outline

- Objective
- Purpose
- Source term development team
- Activity descriptions and status
- Current challenges
- Summary

Objective

- Develop a defensible source term using a consistent approach for all DOE SNF
  - Standardize various DOE site approaches
  - Approach that ensure inventory was inclusive of all DOE SNF
  - Accommodate existing DOE SNF information

Source Term Purpose

- Preclosure safety analyses (BDBE)
- Postclosure TSPA-LA analyses (beyond regulatory period)
- Other potential uses
  - Waste acceptance
  - Interim storage SAR
  - Validate DOE SNF Inventory for YM EIS

Source Term Development Team

- NSNFP - Brett Carlsen (Lead)
  - Jim Sterbentz
- Hanford - Bruce Makenas
- INEEL - Denny Fillmore
- SRS - Bill Swift
- ANL - Dick McKnight
- RW M&O - Don Nitti and others

Activity Descriptions and Status

- A three step development effort
  - Determine how each site calculates source terms
  - Develop a consistent and defensible method to estimate source term for all sites
  - Apply methodology to all DOE SNF inventory

Activity Descriptions and Status (cont.)

- Identify each site's approach and code used to calculate source term for various DOE fuels
- Determine how the calculated source term for the fuel is validated
- January 2000 - DOE/SNF/REP-055 "Methodologies for Calculating DOE Spent Nuclear Fuel Source Terms"

Activity Descriptions and Status (cont.)

- Develop a template methodology for used with all DOE SNF
- Provide examples how to apply the template process for several DOE SNF
- July 2000 - DOE/SNF/REP-059 “Guide for Estimating DOE Spent Nuclear Fuel Source Terms”

Activity Descriptions and Status (cont.)

- Final step nearing completion
  - Identify and develop templates for application
  - Gather fuel and burnup information
  - Select appropriate template
  - Calculate scaling factor (if needed)
  - Calculate and record radionuclide inventory
  - Obtain site concurrence
  - Publish radionuclide inventory estimates

Final Step Status

- Formal review of DOE/SNF/REP-078, Source Term Estimate for DOE SNF: started on 9-4-02
- Methodology is consistently applied to all ~600 Spent Fuel Database records destined for the repository
- Estimates provide radionuclide inventories for both 2010 and 2030
- Based on radionuclide inventories, heat generation rate and 18 energy group photon emission rate are also provided

Final Step Status (cont.)

- Estimated source term presently shows a net increase of up to two orders of magnitude for key isotopes
- Increase is largely due to conservative assumptions for ~2.3% of SNF with highest uncertainty

Current Challenges

- Using these bounding assumptions, 2.3% of the fuels (by BOL HM mass) account for nearly 95% of the the total calculated radionuclide inventory
- Process highlighted relative important of various fuels

Current Challenges (cont.)

- When burnup and BOL HM mass is not known, the methodology assumes BOL mass is twice the EOL mass – which can severely over estimate the fuel burnup
- When information is insufficient to determine a match template, a “worst case” template is used (Intended to bound any conceivable fuel)

Summary

- Requested each DOE site to help refine the SNF information to significantly reduce the radionuclide inventories
- Report review comment resolution in progress
- Expect completion and issuing of report by mid November 2002